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September 20, 2001

David E. Hilliard
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dhilliard@wrf.com

Ms. Magalie Roman-Salas
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Re: ***Ex Parte* Notification - ET Docket No. 98-153 / Ultra Wideband Proceeding**

Dear Ms. Salas:

This is to note that on September 19, Mimi W. Dawson of this firm and I on behalf of Time Domain Corporation along with Jeffrey Ross, Time Domain's Vice-President for Development, and Phillip Inglis met with Monica Desai, Legal Advisor to Commissioner Martin concerning the ultra-wideband proceeding. Copies of the materials discussed during the meeting are enclosed. In accordance with the Commission's Rules, an original and one copy of this letter are being filed.

Respectfully,

David E. Hilliard

David E. Hilliard
Counsel for Time Domain Corporation

cc: Monica Desai, Esq. (w/encl.)
Enclosure

No. of Copies rec'd 0+1
List A B C D E

TIME DOMAIN®

THE PULSE OF THE FUTURE℠

Regulatory Status of Ultra Wideband Technology

What is Ultra Wideband?

Ultra Wideband is a new wireless technology that delivers megabits of data across a wide swath of spectrum using ultra low power so as not to interfere with existing users of the spectrum.

UWB: An "Enabling" Technology

Enables Entirely New Products, Services & Industries

Supports "Break-through" Improvements in:

- Wireless Communication
- Precision Tracking
- Radar

Enabling Technologies:

Transistor

First Transistor- Bell Labs 1947

Invented for:

Replacement of Vacuum Tube

Enabled:

- Transistor Radio
- Integrated Circuits
- Consumer electronics
- Computers
- Automobiles
- Product automation
- Telecommunications
- Medical devices
- Televisions
- Portable Phones
- Calculators
- Instrumentation
- Guided Missiles
- Silicon wafers
- Space Shuttle

Enabling Technologies:

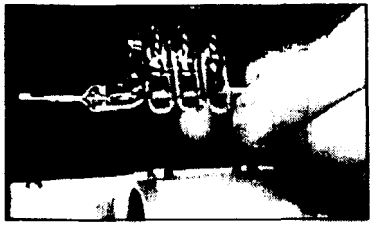
Invented for:

Enabled:

Transistor

First Transistor- Bell Labs 1947

Laser



Optical Laser- 1960

Scientific Discovery

- Holography
- Weaponry
- National Defense
- Telecommunications
- Fiber Optics
- Materials processing
- CD Players
- Printers
- Light Shows
- Surgery
- Genetic Screening
- Retinal Scanning
- Precision Surveying
- Restoration
- Spectroscopy
- Tattoo removal
- Atomic Clocks
- Chip Manufacture
- Remote Sensing
- Security Systems
- Precision Machining

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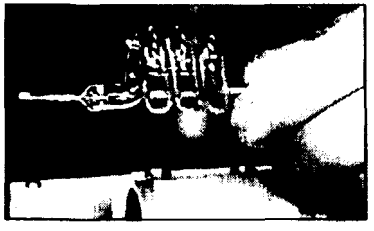
Enabling Technologies:

Transistor

First Transistor- Bell Labs 1947

Laser



Optical Laser- 1960

PulsON UWB Chip

Time Modulated Ultra Wideband -1987

Invented for:

Scientific Discovery

Can Enable:

High Speed Wireless LANs
- **Homes Offices**
- **Wireless broadband Internet**

Set Top Boxes
Indoor/Outdoor Dual-mode Cellular Phones
"P-Commerce"
People Tracking
Asset Tracking
Aviation Ground Tracking
Precision:
- Navigation/ Measurement

Robotics Sensors
Underground Detection:
- Utilities/ Mines

Aviation Safety
Automotive Radar & Sensors:
- Collision Avoidance
- Airbag Sensors

Security Sensors
Invisible Bubbles & Fences
Wall Penetrating Radar
Radar Imaging

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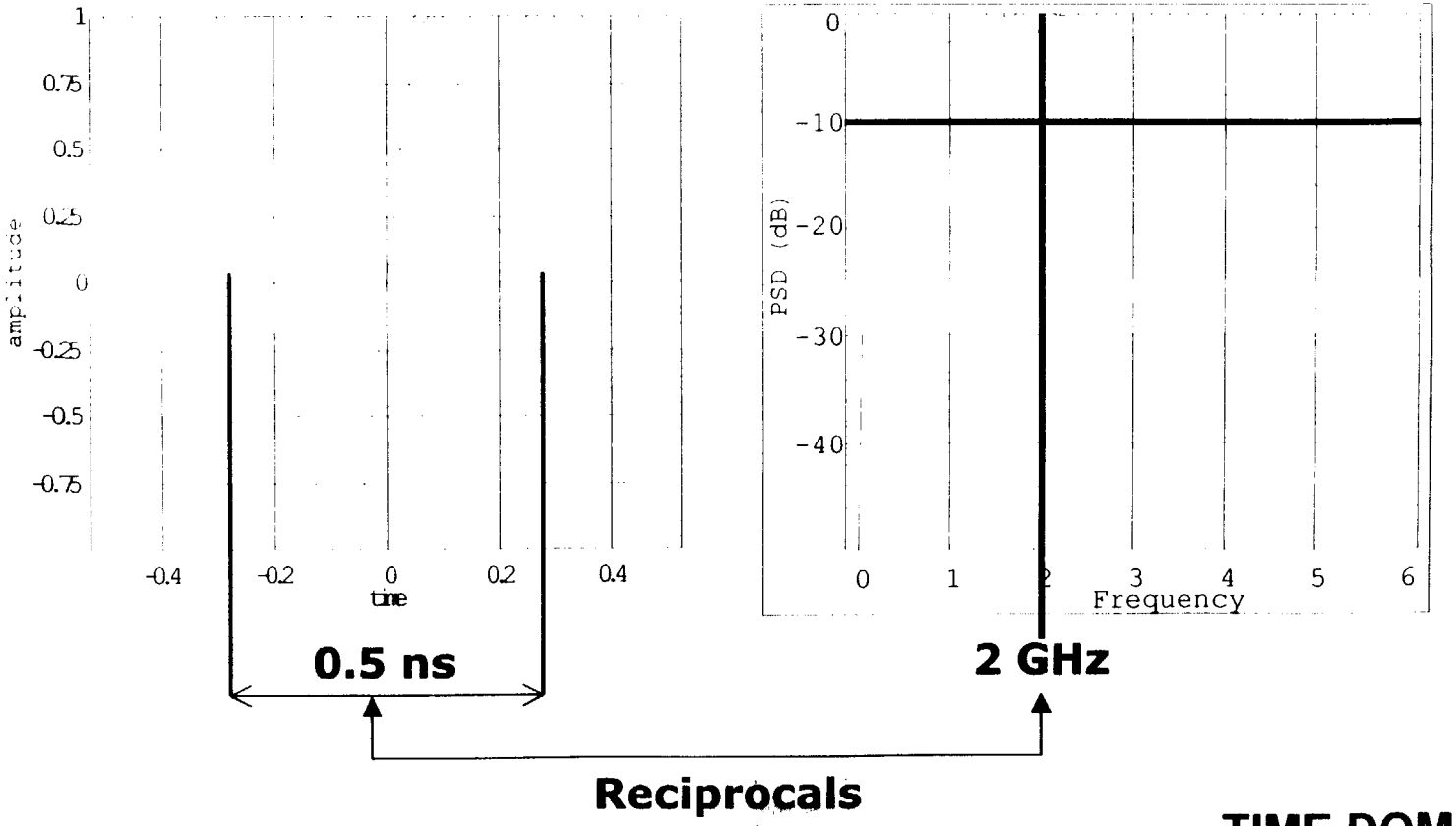
UWB: Transmit RF Pulses

Time Domain

Frequency Domain



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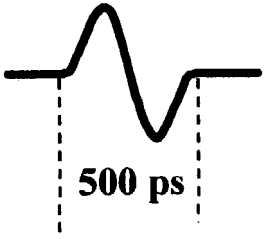
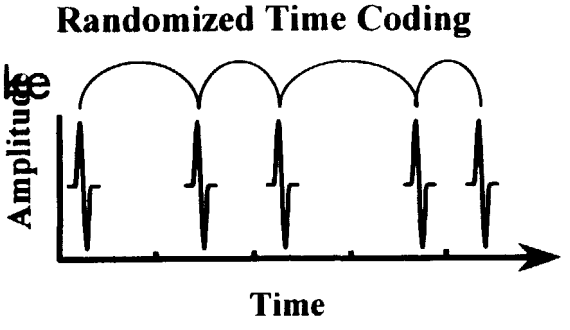
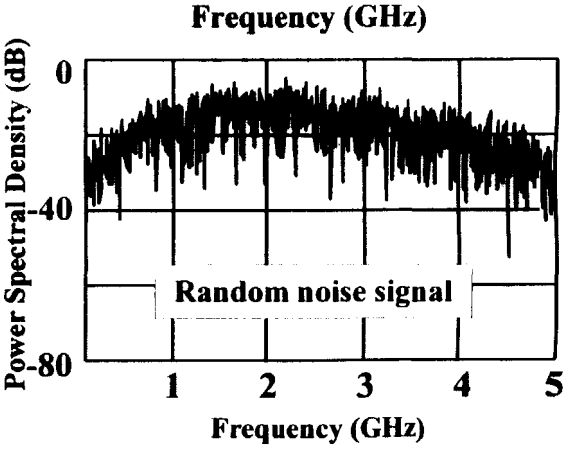
Time Modulated Ultra-Wideband

- Not a sinewave, but millions of pulses per second

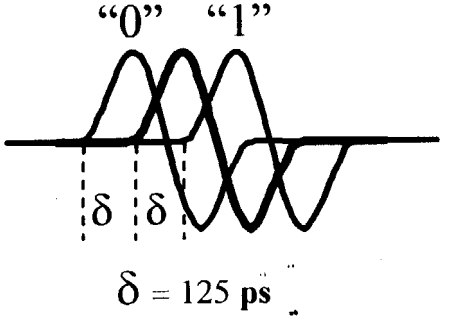


- Time coded to make noise-like
  - Channelization
  - Anti-jam
  - Smooths spectrum





- Early/Late Modulation



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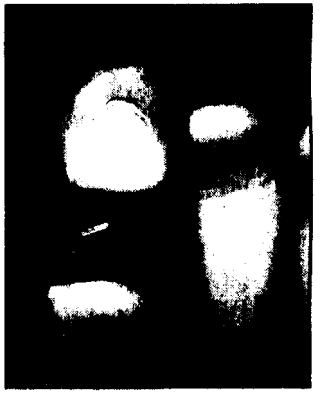
What is Time Domain?

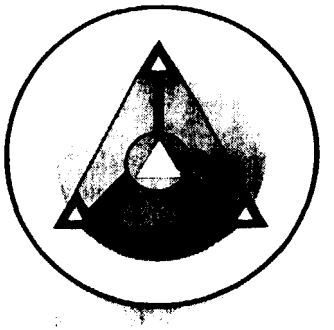
- Developers of first and only UWB commercial chipset – "PulsON"
- 180 employees
- 220 patents – granted or pending
- Worked with FCC since 1989 to secure regulatory approval



PulsON,
A Chip Based Solution

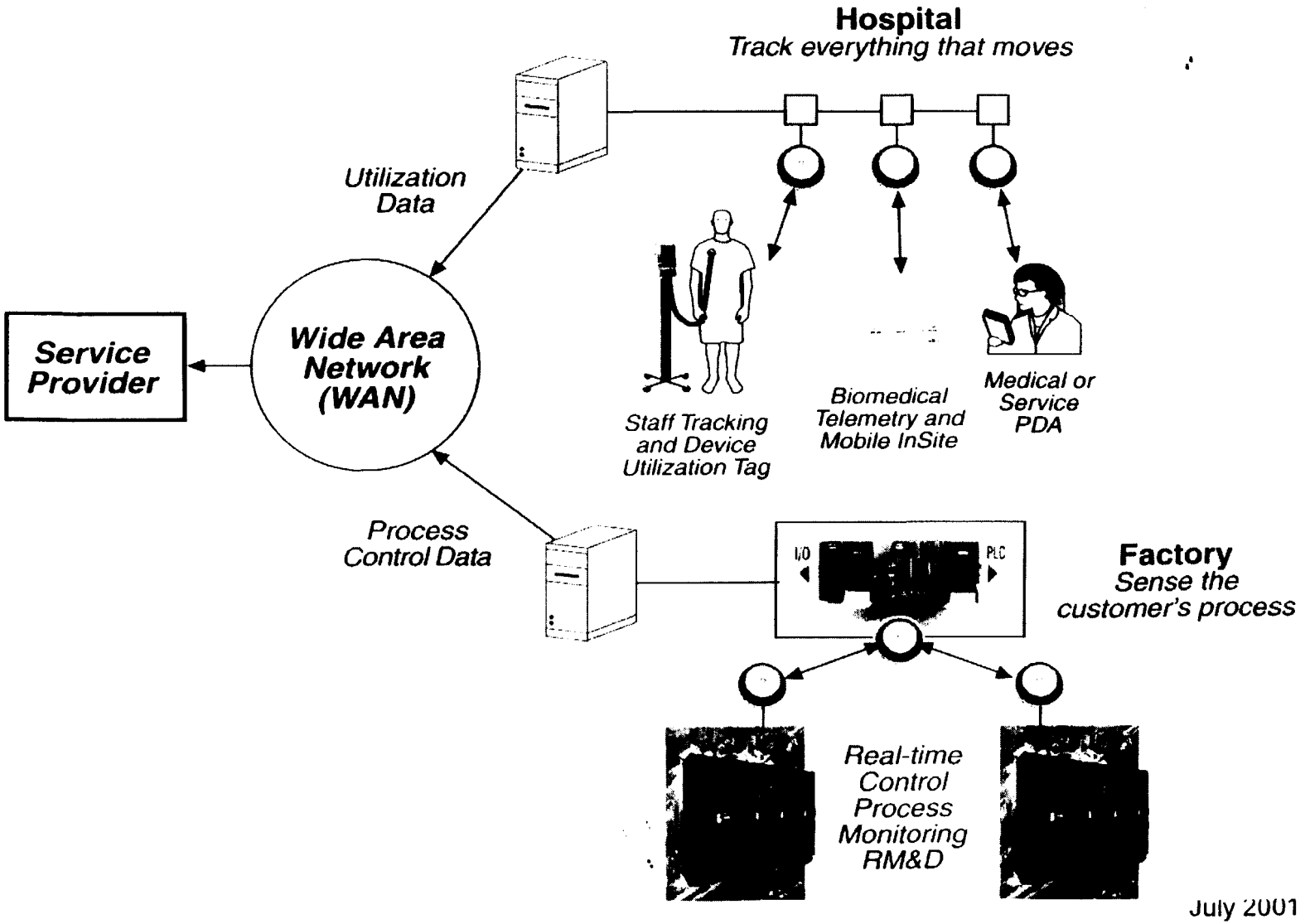
Other Applications -

Positioning *(GPS without Satellites, indoors +/- 1 inch)*



- **Asset Tracking**
  - Medical and Industrial Equipment (GE)
  - Inventory Control and Management
- **People Tracking**
  - Offices, nursing homes, schools, etc.
- **Enabling "M"- Commerce**
  - Moving "location knowledge" indoors for retail sales

GE & Time Domain Product Joint Venture
Hospital Tracking and Communications
Track everything and everyone that moves



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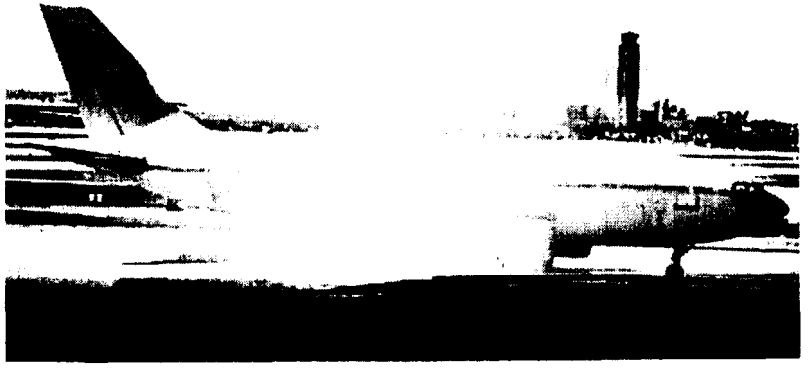
Other Applications -
Radar

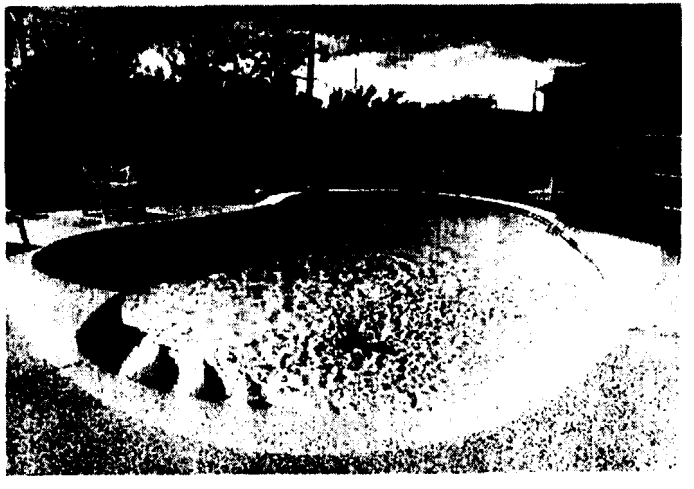
- **Automotive**
  - Collision avoidance
  - Smart air-bags
- **Security sensors**
  - Invisible outdoor security bubbles and fences
  - Accurate indoor motion detection
- **Solids Penetrating Radar**
  - Through walls imaging
  - Underground utility mapping

Potential for...

Zones of security...

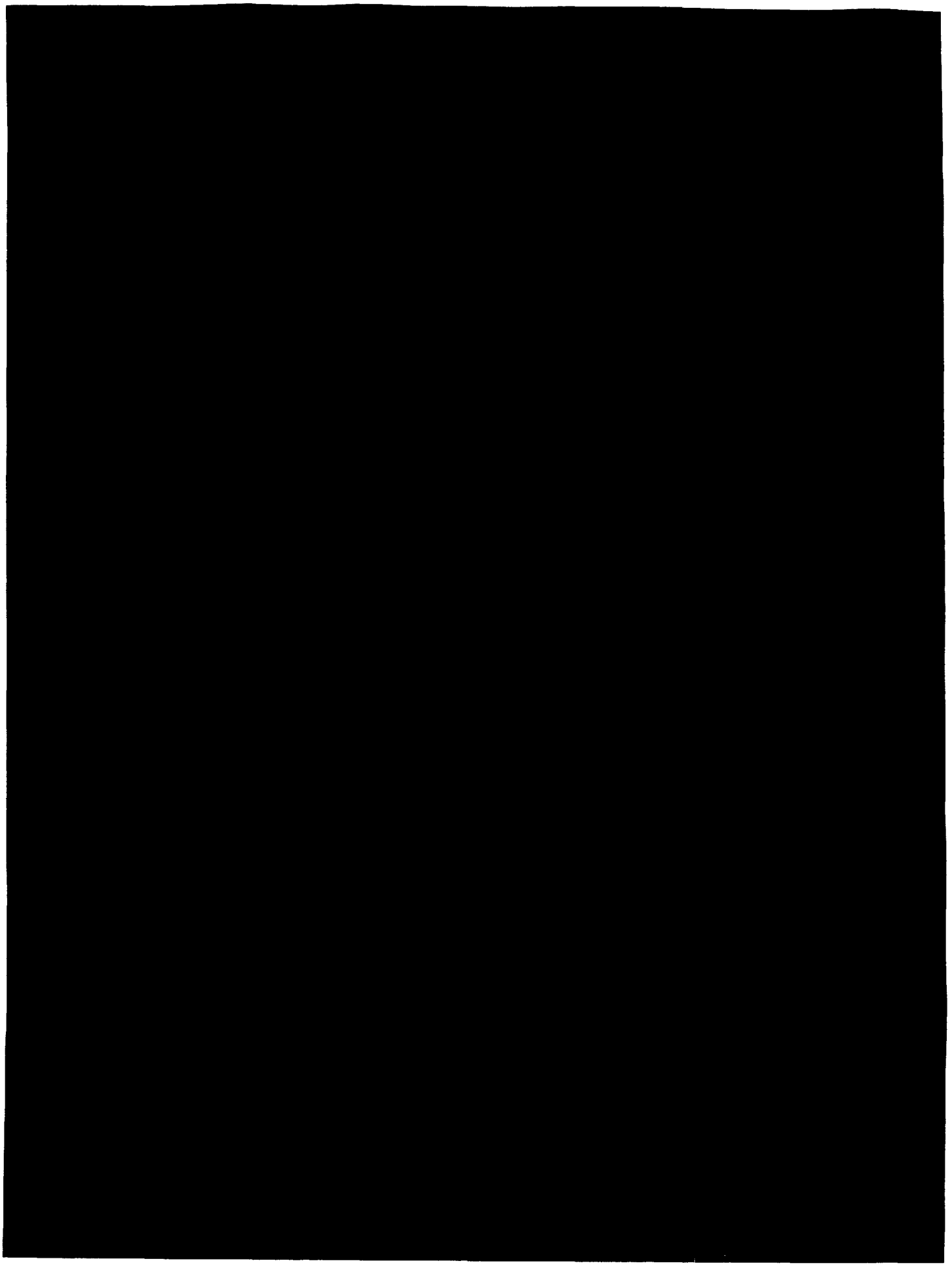


For outside assets...



And high liability areas...

Public Safety



Worldwide Race - Breakthrough Technology

- Active UWB programs in
  - Russia, Germany, UK, Sweden, Finland, & Italy
  - Japan, China, and India

- Jobs/Economic Development
- Global Technology Leadership
- Relieve "spectrum drought"

Regulatory Timeline

Chronology of Time Domain Efforts to Obtain Regulatory Approval for UWB

1989 - 1998: Time Domain Corporation dialogue with the FCC regarding regulatory approval of UWB, including meetings and testing at FCC labs

February, 1998: Time Domain submits a request for a waiver of Part 15 rules to the FCC to allow for limited deployment of UWB technology

September, 1998: The FCC issues a Notice of Inquiry (NOI) asking questions about UWB technology

February, 1999: Time Domain (and other companies, public interest groups and individuals) submits comments on the NOI to the FCC

June, 1999: The FCC grants Time Domain's waiver request for a limited number of life-saving, through-wall Radarvision devices for use by the law enforcement and public safety communities

May, 2000: The FCC issues a Notice of Proposed Rulemaking (NPRM) for UWB, discussing the life-saving and other public benefits of the technology

September 12, 2000: Time Domain (and other companies, public interest groups and individuals) submits its responses on the NPRM to the FCC

October 27, 2000: Time Domain (and other companies, public interest groups and individuals) submits its replies to all the NPRM responses to the FCC

Part 15

- "Part 15" is an FCC rule section that allows low-powered wireless devices to operate on a shared or non-interfering basis with existing spectrum users.

- Characteristics of Part 15 operations:
  - Unlicensed operations
  - Low power devices - less than 50 billionths of a watt of power
  - Interference protection for licensed services
  - Strict power limits - e.g. -71 dBW/MHz (about 50 billionths of a watt) is most strict limit
  - FCC authorization, certification, enforcement

Billions of Part 15 devices already in operation:

- cordless phone receivers
- personal computers
- unlicensed PCS phone receivers
- personal digital assistants
- wireless modems
- remote car door opener receivers
- home security system receivers
- spread spectrum network systems

What is Harmful Interference?

FCC Rules: "Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with these [international] Radio Regulations." 47 CFR § 2.1

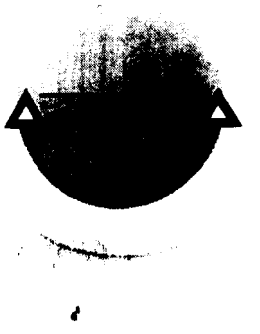
NTIA Definition: NTIA ITS website adds that harmful interference "must cause serious detrimental effects, such as circuit outages and message losses, as opposed to interference that is merely a nuisance or annoyance that can be overcome by appropriate measures."

The FCC must decide what constitutes "harmful interference." This is a critical spectrum management issue. Not all testing will yield this information.

GPS Susceptibility Issue

- UWB has received the most opposition from the GPS community
- Substantial testing has been conducted
  - JHUAPL, NTIA and Stanford
  - More data than for any other FCC proceeding
- DoD's Joint Spectrum Center determined that all GPS tests (found the same thing for noise coded UWB signals

Current Product Applications -
Wireless Communications



- **High Speed Indoor Wireless Networks**
  - Entertainment networking (set-top boxes and gateways)
  - Home and Office LANs
  - Personal Area Networks
- **Time Domain Chipset Product:**
  - P200 (Q4 2001): "Real" 40 Mbps
  - P300 (Q4 2002): >100 Mbps

FCC Has Seen This Before - 1

Satellite PCS Phones Proceeding (PCSGEN Docket No. 98-68)

GPS Position: "Preliminary analysis of the potential interference into GPS receivers from GMPCS terminals operating at the power levels proposed in the NPRM *(see attached Declaration of Stanford University professor Per Enge)* shows that GPS receivers could be subject to unacceptable levels of interference from GMPCS terminals."

and from an affidavit provided in this filing by Stanford University Professor Per Enge: "Based on my theoretical evaluation of the interference situation, the FCC's proposal to permit mobile earth terminals to produce emissions in the GPS operating band at levels of –70 dBW/MHz, even on an interim basis, could subject certain GPS receivers to significant levels of interference."

FCC Decision: A report and order was issued December 23, 1998, affirming the –70 dBW/MHz standard proposed by the FCC.

FCC Has Seen This Before -2

Public Safety Communications in 700 MHz band (WT Docket No. 96-86)

GPS Position: In this filing, the GPSIC, the Air Travelers Association, American Airlines, the General Aviation Manufacturers Association, Outreach, *Stanford University (the GPS Research Program),* and United Airlines were collectively referred to as GPS Commenters. "The answer the GPS Commenters provided is that the proposed standard is not sufficient. They showed that the public safety service uses proposed by Motorola and other commenters at 794-806 MHz would endanger a GPS system that is dynamic, growing and critical (in both a public safety and an infrastructure context), and that the –70 dBW/MHz out-of-band emission level that is unidentified as sufficient to protect GPS operations is woefully deficient."

FCC Decision: The Third Memorandum Opinion and Order was issued October 10, 2000. The FCC adopted the out-of-band limits of –70 dBW/MHz for wideband emissions and the –80 dBW/MHz limit for narrowband emissions falling within the 1559 –1610 MHz band.

FCC Has Seen This Before – 3

700 MHz Public Safety Proceeding (WT Docket 99-168)

GPS Position: "In these Reply Comments, the Council emphasizes that it has demonstrated that the –70 dBW/MHz/-80 dBW/MHz standards do not adequately or universally protect GPS... The Council also emphasizes that, based on actual studies and demonstrations, the only default level that can safely be established at this point to protect GPS receivers is a wideband OOBE threshold limit of –100 dBW/MHz."

FCC Decision: In its First Report and Order issued January 7, 2000, the Commission adopted the –70 dBW/MHz (wideband) and –80 dBW/MHz (narrowband) out-of-band emissions limits for signals falling into the 1559 – 1610 MHz band. These limits were designed to protect against the second harmonics of certain 700 MHz transmitters. These limits are premised on protecting aviation GPS use at a distance of about 30 meters.

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UWB Testing
NTIA Non-GPS Testing

- Results released Jan. 18th – NTIA tested 3 government systems (by making 7 field measurements), and extended its conclusions using a theoretical model to an additional 12 systems.
- Even with conservative assumptions, NTIA still concluded that UWB deployment is feasible.
- **No harmful interference was observed – no reported occurrences of degradation, obstruction or repeated interruptions of the operations of the services tested.**

GOVERNMENT AND DEFENSE PROJECTS

TIME DOMAIN GOVERNMENT PROJECTS

National Institute of Standards and Technology Advanced Technology Program

- Internal communications and tracking system for medical equipment

NASA Johnson Space Center

- Astronaut / Space Station Extra Vehicular Activity communications and position location and tracking for space walks: Phase II Small Business Innovation Research contract
-

National Science Foundation

- Universal Home Networking: Phase I Small Business Innovation Research contract

Department of Commerce

- Firefighter locator: Phase I Small Business Innovation Research contract

NASA Glenn Research Center

- Phased Array and SAR Radar: Phase I Small Business Innovation Research contract

NASA Goddard Space Flight Center

- Interspacecraft Communication: Phase I Small Business Innovative Research contract

NASA Marshall Space Flight Center

- Terahertz waveform Cooperative Research and Development Agreement (CRADA)

TIME DOMAIN DEFENSE PROJECTS

DoD Military Operations in Urban Terrain Advanced Concept Technology Demonstration

- Through wall radar for military operations in urban terrain to clear buildings by detecting human presence through walls

Office of Naval Research

- Location and status tracking system for environmental conditions history and shelf life of ammunition in storage depots to circumvent the need for destructive testing and lot sampling

Office of the Assistant Secretary of the Navy for Safety and Survivability

- Personal, Position, Location, and Tracking System to locate sailors aboard ships during life-threatening situations

Army Missile and Aviation Command Advanced Concept Office

- Over-the-horizon communications link using unmanned aerial vehicles: Phase II Small Business Innovation Research contract

Army Missile and Aviation Command Weapons Sciences Directorate

- Blue Laser research: Phase II Small Business Technical Transfer Research contract

Army Tank Automotive and Armaments Command Tank Automotive RDE Center

- Terrain mapping radar system to provide ground truthing for Grizzly mine-breaching program: Phase II Small Business Innovation Research contract

Army Simulation Training and Instrumentation Command

- Advanced Tactical Engagement Simulation Program for the Objective Infantry Combat Weapon to detect hits on non line-of-sight targets during military exercises: Phase II Small Business Innovation Research contract

Army Simulation Training and Instrumentation Command

- Cooperative Research and Development Agreement to introduce time modulated ultra wideband technology into military training

National Security Agency

- Technology license for Army Research Laboratory to study how and where time modulated ultra wideband communications should be implemented for the Army

Marine Corps

- Personnel Identification System: Phase I Small Business Innovative contract

Defense Threat Reduction Agency

- Evaluation of UWB for airborne surveillance and ground penetrating radar

Land Warrior Program

- Evaluation of UWB for Land Warrior Program

Army STRICOM

- Development of Mobile ad hoc networking BAA with military and commercial dual-use capability

Army STRICOM

- Aim-point determination and geometric pairing solution for OICW weapon system: Phase II Small Business Innovative Research contract

DoD Office of Science and Technology

- OST IDIQ Program

Navy Sea Systems Command (NAVSEA)

- UWB engineering expertise for technology insertion into Naval Applications

Navy Research Lab (NRL)

- To provide precise timing via wireless

COMPLETED PROJECTS

Defense Advanced Research Projects Agency Advanced Technology Office

- Self-Healing Minefield program that causes mines to autonomously fill in minefield breaches

Army Corps of Engineers

- Cooperative Research and Development Agreement to mark locations of unexploded ordnance on training ranges, for subsequent munitions clearing

Army Space and Missile Defense Command Battle Lab

- Wireless communications for Future Operations Center local area network, the next generation tactical operations center

Army Simulation Training and Instrumentation Command

- Lightweight Personnel Detection Device to track soldiers during military training exercises

L3 Communications

- Provision of 3 full duplex evaluation PulsON radios with propagation software.

Navy Training Command

- Demonstration of Time Domain's PulsON® radio to track weapons on a training range: Phase 1 Small Business Innovation Research contract

Army Material Command

- Proposal to support intelligent mines with PulsON® radar sensor and PLT

National Telecommunication & Information Agency

- Utilization of the PulsON® pulsers to facilitate interference testing in support of the FCC NPRM

National Telecommunication & Information Agency

- Utilization of PulsON® pulsers to facilitate interference testing in support of the FCC NPRM

Johnson Space Center

- Astronaut / Space Station Extra Vehicular Activity communications and position location and tracking for space walks: Phase I Small Business Innovation Research contract

Army Missile and Aviation Command Advanced Concept Office

- Over-the-horizon communications link using unmanned aerial vehicles: Phase I Small Business Innovation Research contract

Air Force Rome Labs

- UWB SAR Research: Phase I Small Business Innovation Research contract

Army Missile and Aviation Command Weapons Sciences Directorate

- Photonics Research Support: Phase I Small Business Innovation Research contract

Army Missile and Aviation Command Advanced Concept Office

- Over-the-horizon communications link using unmanned aerial vehicles: Phase I Small Business Innovation Research contract

Army Tank Automotive and Armaments Command Tank Automotive RDE Center

- Terrain mapping radar system to provide ground truthing for Grizzly mine-breaching program: Phase I Small Business Innovation Research contract

Army Simulation Training and Instrumentation Command

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